Space Weather Technical Forecast

Issued on Wednesday, 26 June 2024 at 13:29 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Further M-class flares likely. Chance of G1/Minor geomagnetic storms days 3 and 4.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with an isolated low level M-class flare, peaking M1.0 at 25/1245 UTC from AR3723. There are nine regions currently on the disc. AR3723 is an unusually long-lived feature that continues to bring a chance of notable flares, a weak delta configuration persists within its intermediate region. The new region rotating onto the east limb is gradually becoming more visible, now analysed as a moderately long structure but with a simple magnetic structure apparent. AR3719 in the southwest has a Beta-Gamma magnetic configuration. AR3720, also in the southwest retains it's classification, though no gamma magnetic complexity is present. All The other regions on the disc are generally simple and stable. Magnetic looping from AR3712/AR3713 is still present around the southwest limb.

Three CMEs with potential Earth directed components have been observed in recent days. One from 23 June and two from 25 Jun.

Solar Wind / Geomagnetic Activity: Solar wind speeds observed by ACE at L1, were at background levels, between 320-370 km/s. Density remained below average. Interplanetary Magnetic Field, Bt, was weak to moderate, occasionally peaking at 12 nT overnight. The north-south component, Bz, was weak to moderate, but mostly positive until 26/0600 UTC, reaching +11nT, before becoming predominantly negative thereafter, reaching -9nT. The phi angle was mostly negative (toward the Sun), with a period of positive (away from the Sun) between 26/0315-0800 UTC. Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 remained at background levels with no solar radiation storms occurring. High energy electron flux (greater than 2MeV) observed by GOES16 was at background. The 24-hour fluence remained below Active, reaching 1.19e6 integrated pfu by 26/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a chance of further M-flares, with a slight chance of isolated X-class flares. These most likely from AR3723 in the southeast.

Solar Wind / Geomagnetic Activity: Three CME's feature in the forecast period. The first from 23 Jun may have a glancing impact on day 2 (27 Jun). The second from early on 25 Jun may have a glancing impact on day 3 (28 Jun). The third CME from late on 25 Jun is likely to arrive on day 4 (29 Jun) or perhaps after this forecast period. Otherwise, solar winds are expected to remain indicative of a slow background conditions.

Geomagnetic activity is expected to be Quiet to Active days 1 and 2 (26/27 Jun). There is then a chance of G1-G2 Minor/Moderate Storms later day 3 or day 4 (28/29 Jun) due to the arrival of the second and third CMEs.

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at

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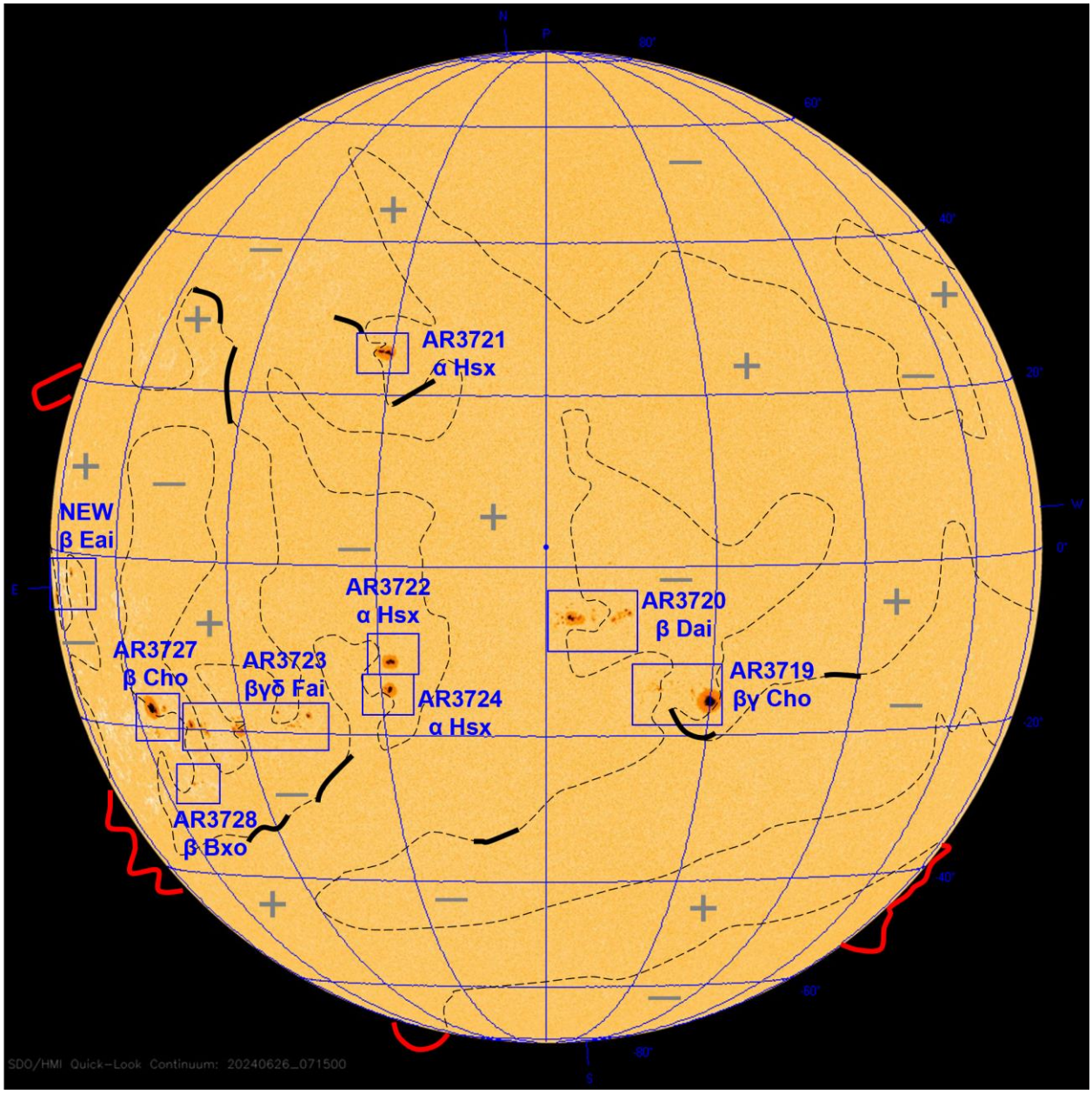
background levels. However, there is an initial slight chance of exceeding the S1/Minor Storm threshold should any notable flares occur from any of the three large sunspots now around the western limb. High energy electron flux is forecast to be at background. The associated 24-hour fluence is expected to remain well below the Active threshold.

Figure 1. Solar Analysis Valid 26/0715UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are three CME's of note. The first, is associated with a filament eruption on 23 Jun and is expected to miss just behind and south of Earth. However, a weak glancing influence cannot be completely ruled out late on day 2 (27 Jun). The second CME is due to the large filament disruption off the west disc early on 25 Jun, resulting in a broad asymmetric partial halo as seen from STEREO A. This CME has a potential Earth directed component possibly arriving late on day 3 (28 Jun). Although the CME was slow, and only a glancing blow is indicated, filament eruption CMEs can be rather dense on arrival, and so there is a chance of G1/Minor geomagnetic storming. The third CME was associated with a C3.9 flare from near AR3720 late on 25 Jun. There was a weak signal in LASCO C2 imagery, with analysis of this CME having an Earth directed component arriving day 4 (29 Jun) or perhaps after this forecast period.

Aside from any CME arrivals, solar winds are expected to remain indicative of a slow background flow with no coronal holes of significance currently on the Earth-facing disc. Solar wind speeds are likely to persist at background with geomagnetic activity forecast to be mainly Quiet, with a chance of isolated Unsettled intervals. The first CME is unlikely to give more than Active intervals, even if an impact is observed. The second and third CMEs have the potential to give G1-G2 Minor/Moderate Storms later day 3 or day 4 (28/29 Jun).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	10	40	40
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
24/0054	Nil	Filament	SE	436 km/s	27 Jun	Small chance glance 27 Jun
25/1555	Partial (from St A)	Filament	W	493 km/s	Late 28 Jun	Preliminary analysis. Further assessment required.
26/0701	Partial	Flare C3.9	Centre	395 km/s	29 or 30 Jun	Likely earth directed but weak signal in imagery

Figure 2: MOSWOC ENLIL

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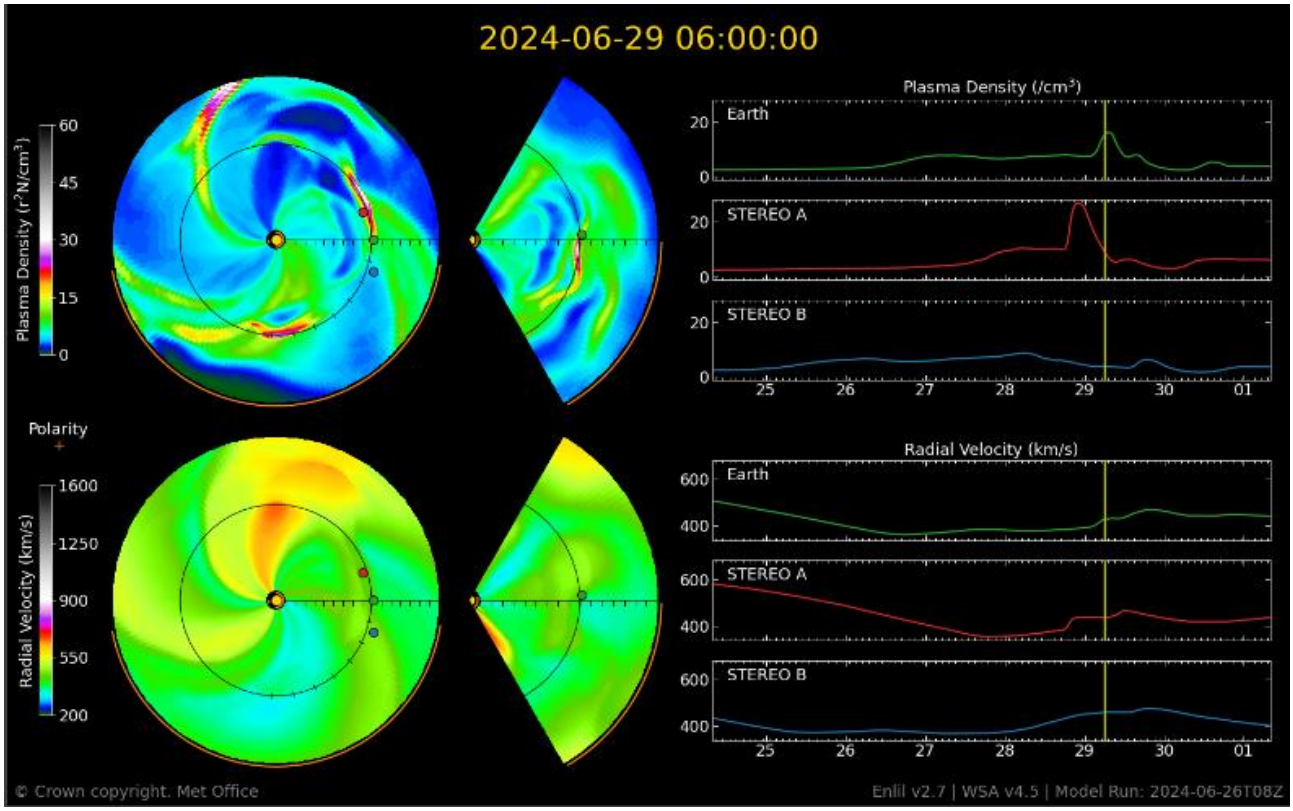

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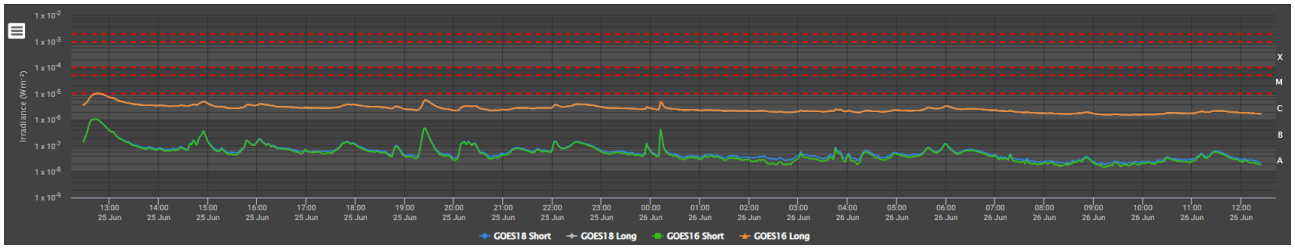
Radio Blackouts - X-Ray Flares:

There are nine regions currently on the disc. AR3723 is most likely formed from the remnants of AR3697 (and AR3664), and is an unusually long-lived feature that continues to bring a chance of notable flares, showing a recent spreading trend with a slight reduction in size, though a weak delta configuration persists within its intermediate region. The new region rotating onto the east limb is gradually becoming more visible, now analysed as a moderate long structure but with a simple magnetic structure apparent. AR3719 in the southwest has complexified, now with a Beta-Gamma magnetic configuration. AR3720, also in the southwest retains it's classification, though no gamma magnetic complexity is present. All The other regions on the disc are generally simple and stable, with only minor alterations in recent hours. Magnetic looping from AR3712/AR3713 is still present around the southwest limb.

Solar activity has been Moderate with an isolated low level M-class flare, peaking M1.0 at 25/1245 UTC from AR3723. There is an ongoing likelihood of further isolated M-class flares, and a slight chance of X-class flares, primarily from AR3723 or the new region on the eastern limb.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	55	55	55	55
Very Active	R3 to R5 X Class	No	5	5	5	5

Figure 3: 24 hr X-ray trace



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Solar Radiation Storms - (High Energy Protons):

High energy proton flux, as measured by GOES 18, is expected to remain at background levels. However, there is an initial slight chance of exceeding the S1/Minor Storm threshold should any notable flares occur from any of the three large sunspots now around the western limb. The majority of the current sunspots on the disc persist in the eastern hemisphere, including the most significant region AR3723.

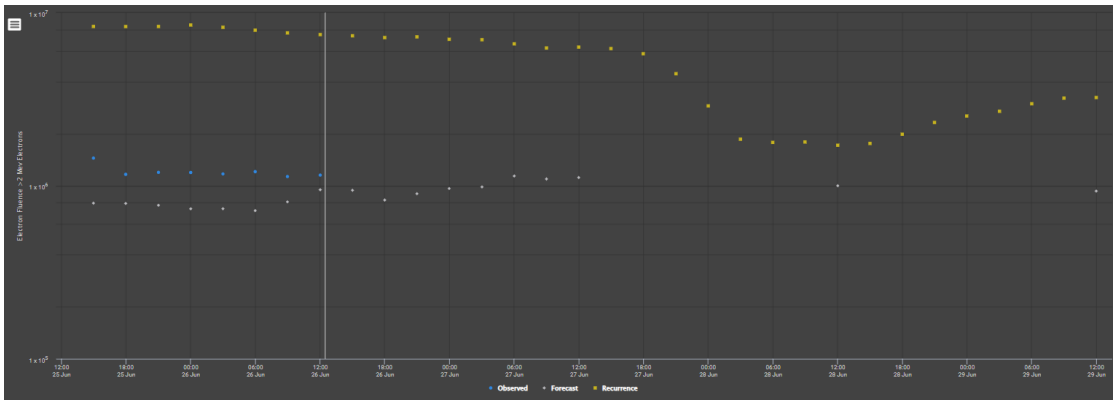
Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux, as observed by GOES-16, has been at background. With no notable sources of enhancement forecast, flux is expected to persist at this level.
Associated electron fluence is expected to persist well below the Active threshold (1e8 integrated pfu), with MOSWOC REFM output considered to be giving good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 5: MOSWOC REFM



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